June 2, 1942. W. H. WARD 2,284,781

HOPPER

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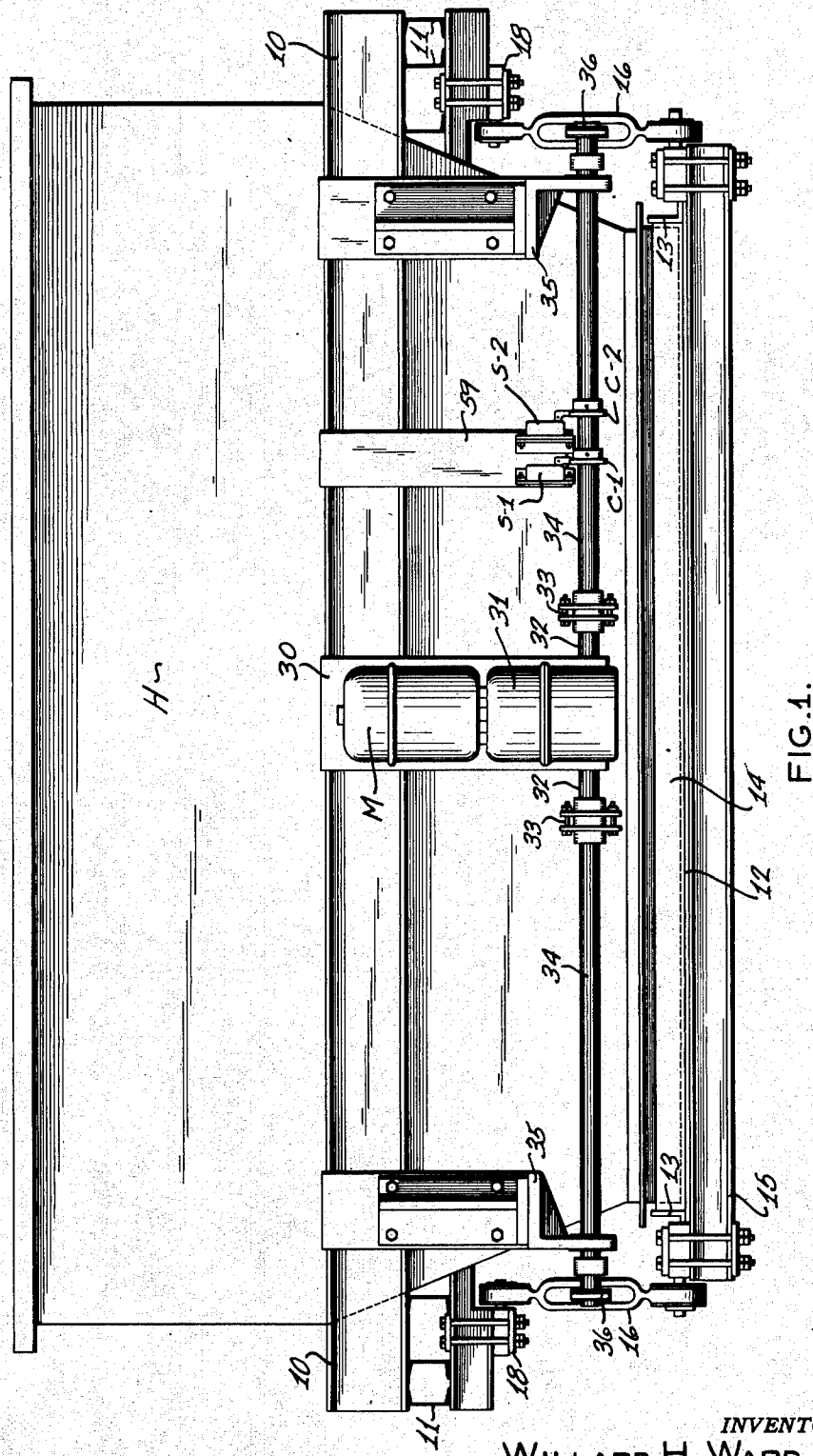


FIG. 1.

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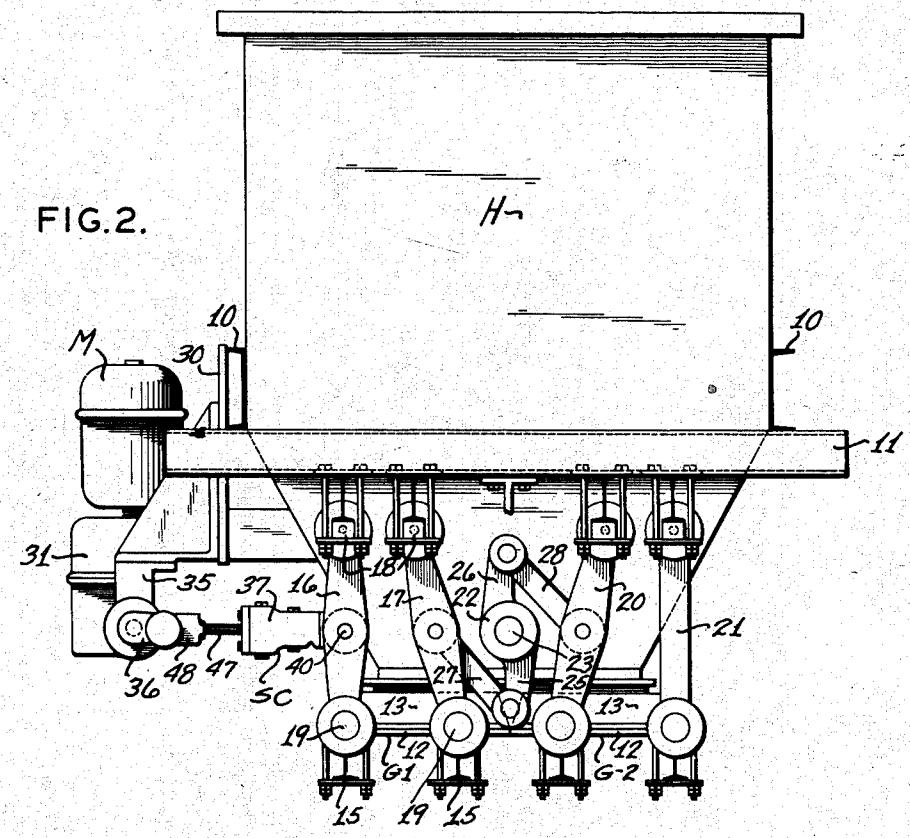
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FIG.2.



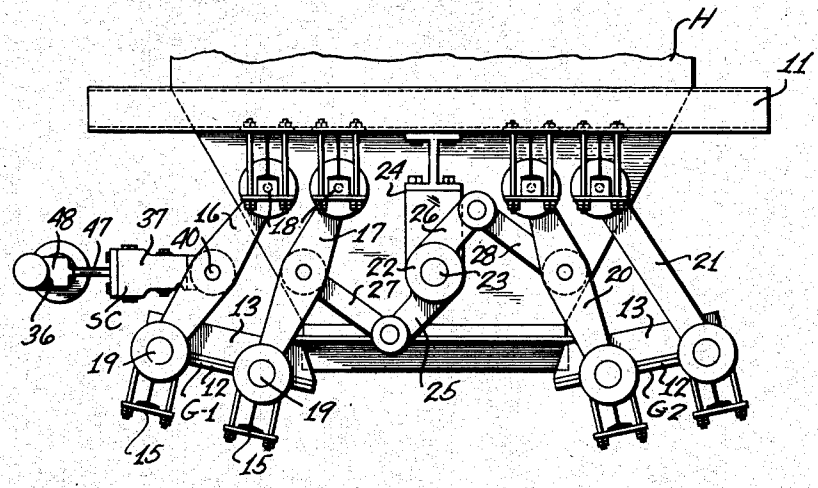


FIG.3.

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UNITED STATES PATENT OFFICE

2,284,781

HOPPER

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Application March 27, 1940, Serial No. 326,137

2 Claims. (Cl. 221—144)

This invention relates to hoppers used in connection with the handling of bulk material, and more particularly to improvements in hopper gate mechanism and means for controlling the same.

The object of the invention is the provision, in a gravity discharge, dual gate hopper, of improved means for supporting and operatively connecting the gates for reciprocal, co-ordinated movement to enable the gates rapidly to be rocked to open and closed positions with a minimum of applied power.

Other objects and advantages will appear from the following description and accompanying drawings illustrating a presently preferred embodiment of the invention. In the drawings:

Fig. 1 is a side elevational view of a hopper provided with the means of the invention, and Figs. 2 and 3 are end elevational views of the hopper of Fig. 1, showing the gates and operating mechanism therefor in closed and open positions respectively.

Referring now by characters of reference to the drawings, H designates the hopper which is supported by a rectangular frame structure comprising side beams 10 interconnected by end beams 11. The discharge opening at the bottom of the hopper is adapted to be closed by a pair of coacting gates G—1 and G—2, each comprising an elongate plate 12 having upstanding flanges 13 at the end margins, and an upstanding flange 14 at the outer side margin thereof. Each of the gates is mounted on a cradle structure, consisting of laterally spaced beams 15 which extend longitudinally in underlying relation to the plate 12, the beams 15 of gate G—1 being supported at their ends by rocker arms 16, 16 and 17, 17. As best appears from Fig. 2 the rocker arms 15 and 16 are journalled at their upper ends on hangers 18 that depend from the hopper frame beams 11, and stub shafts 19 projecting longitudinally from the ends of the cradle beams 15 are journalled in the lower ends of the rocker arms 15 and 16. Gate G—2 is supported in like manner on rocker arms 20, 20 and 21, 21.

The gates G—1 and G—2 are operatively connected for coordinated reciprocal movement to open and close the hopper discharge passage by means of rockers 22, one thereof being provided at each end of the hopper. The rockers 22 are located between the cradle rocker arms 17 and 20 of the two gates and are journalled on stub shafts 23 carried by bearing brackets 24 that depend from the hopper beam 11. The rockers 22 have arms 25 and 26 disposed in substantially 180° angular relation. The arm 25 is pivotally connected to one end of a link 27 whose opposite end is pivotally connected to cradle arm 17 at the center thereof, and similarly, a link 28 operatively connects the arm 26 of the rocker to cradle arm 20 of gate G—2.

It will now appear that a force acting on gate G—1 in a direction to move it toward the left (Fig. 2) or in an opening direction, is transmitted through link 27 to effect clockwise rotation of rocker 22. Such movement of rocker 22 is transmitted through link 28 to cradle arm 20 to cause gate G—2 to move to the right or in an opening direction. The gates are thusly connected for conjoint movement away from and toward each other to open and close the hopper discharge passage.

As a power means for opening and closing the hopper gates as aforesaid, there is provided an electric motor M, mounted on a plate 30 which is secured to one of the side beams 10, centrally thereof. Also mounted on plate 30 below the motor is a suitable speed reduction gear unit, designated 31, and which includes a driven shaft 32. Connected to the opposite ends of shaft 32 by suitable couplings 33 are shaft sections 34 that extend horizontally beyond the ends of the hopper and are supported by bearing brackets 35 that depend from beam 10. Fixed to the outer ends of the shaft sections are cranks 36 which are operatively connected to the cradle rocker arms 16 by safety coupler devices, designated generally SC.

The purpose of the safety coupler SC is to preclude damage to the motor or other parts of the gate operating system such as might result from an object becoming lodged in the mouth of the hopper and blocking gate movement against the action of the motor tending to close the gates. Briefly, the so-called safety coupler SC comprises a body member 37 having journalling means at one end by which it is connected to a pin 40 on rocker arm 16. A plunger rod 47 has journalling means 48 at one end, and its opposite end extends into the coupler body member 37. Suitable yieldable restraining means contained within the body member 37 normally hold plunger rod 47 in an extended position, as shown in Figs. 2 and 3. Such means are adapted to yield when abnormal compressive pressures are exerted at the ends of the coupler, to permit plunger rod 47 to move inwardly of the coupler body. Under such a condition movement of cranks 36 is not transmitted to rocker arm 16

but, instead, the movement is taken up by collapsing of the coupler.

Suitable electrical means are provided for controlling the operation of motor M, such means including a motor starting switch (not shown), directional limit switches S—1 and S—2 mounted on a bracket 59, and actuated by cams C—1 and C—2 mounted on shaft 34, Fig. 1. Switch S—2 serves automatically to break the motor circuit and stop gate movement when the gates have obtained an open position, and switch S—1 functions to interrupt the motor circuit following subsequent operation of the motor to restore the gates to closed position.

I claim:

1. In a hopper having a discharge passage at its lower end, a supporting frame, a pair of laterally related coacting gates for said discharge passage, below said frame, a pair of laterally spaced arms at each end of each of said gates for the support thereof, the upper and lower ends of said arms being pivotally connected respectively to said frame and gates, a rocker member disposed between the pairs of supporting arms at each end of the hopper, said rocker member having a central pivotal mounting and arms extending in opposite directions therefrom, a pair of links operatively interconnecting the remote ends of said rocker arms, each to one of said gate supporting arms.

2. In a hopper having a supporting frame and a bottom discharge opening spaced below said frame, a pair of coacting gates for said opening, a pair of supporting arms at each end of each gate, said arms being pivotally connected at their upper ends to said frame and at their lower ends to said gates, a rocker member pivotally mounted on said frame at each end of the hopper between opposed supporting arms of the gates, a link pivotally connecting each rocker at one side of its pivotal axis to a supporting arm of one gate, a link pivotally connecting each rocker at the opposite side of its pivotal axis to a supporting arm of the other gate, said rockers and links serving to interconnect the gates for conjoint movement toward and from each other; means for actuating the gates comprising a motor mounted on said frame at one side of the hopper, a rotatable shaft operatively connected to said motor and extending horizontally along one side of the hopper, cranks fixed to the opposite ends of said shaft, and coupler devices connecting opposed supporting arms of one gate to said cranks for reciprocating movement thereby.

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